PUBLIC HEALTH REPORTS.

THE CAUSATION AND PREVENTION OF PLAGUE.

The following extracts are from a series of lectures on plague delivered June last before the Royal College of Physicians of London by Dr. W. J. R. Simpson, professor of hygiene at King's College, London, and government commissioner to inquire into the causes and continuance of plague in Hongkong, 1902:

Modes of dissemination of plague and channels of infection.—It is now accepted that the importation of plague into a healthy locality can be effected by an infected human being, or an infected rat, or infected clothes. Observations have been so numerous as regards these agencies as to remove all doubt on this point. Dr. E. E. Klein has further shown by some important experiments that infected grain may also be an agent in the importation of the disease. By feeding rats and guinea pigs with grain which had been contaminated with old cultures of plague, and which was then dried, he was able to cause plague in those animals, so that grain which has been infected with infective material from plague rats or human beings may, on importation into a healthy seaport, give plague to healthy rats on shore which eat the contaminated portions of the grain. The association of corn ships with plague is a very old one. In recent years the association has been ascribed almost wholly to plague rats on board ship which have left the ship and infected healthy rats on shore, but now infected grain must be added as a likely agent.

Once imported, the dissemination of the disease is effected by similar agents as those bringing about importation. Rats, clothes, human agency, and food play their respective parts. It is now almost universally admitted that, except in pneumonic cases, rats are the principal agents in the dissemination of the disease, though personal contact, as in typhoid fever, also plays its part. They bring the infection into houses connected with their subterranean passages. In Hongkong one could trace many of the subterranean passages with their infected rats and their connection with the distribution of the disease in the houses. A systematic bacteriological examination of rats trapped and found dead proved that plague in the rats of the locality preceded plague in man. So constantly did this occur that as soon as plague-infected rats were discovered measures were introduced, as in Cape Town, but on a more extended and systematic basis, of treating the house or locality as plague infected. In other words, a policy of forestalling plague was adopted. The precedence of rat plague in relation to plague epidemics was observed in Bombay, the Punjab, Calcutta, South Africa, Australia, and southern China. The value of the Hongkong observations lay in the direct evidence obtained by scientific and precise methods not only of the direct relationship which the precedence of rat plague bore to human

plague, but also of the important rôle which the rat plays in the spread of the disease from house to house and in groups of houses. Similar observations were made by Dr. J. Ashburton Thompson, in Sydney, but under different conditions. The Sydney outbreaks are comparatively mild, the mortality being under 40 per cent, and consist mainly of bubonic cases with but few septicæmic cases. Probably the type in Sydney was the same as that met with in Cape Town, where one of the marked features was absence of cerebral symptoms and intestinal disorders, differing in this respect from the type met with in Poona in 1897, but which in 1907 seemed to me to have changed, presenting fewer nervous symptoms. The Hongkong outbreaks are exceptionally virulent, the mortality being over 80 and 90 per cent and with a large percentage of septicæmic cases.

The problem of the dissemination of the disease by rats is not solved by simply proving that rats are infected with plague in a house or locality before human beings, or by the fact that if measures are taken to dispose of the infected rats human plague will not occur, and, vice versa, if no measures are taken plague will attack some of the inmates of the house. The question naturally arises, How is the infection of the rat transferred to man? There are two views and the upholders of each have a tendency to claim that theirs is the only way. The more that is learned of plague the more it is evident that there is no only way.

The flea theory.—Dr. Ashburton Thompson had exceptional opportunities of studying the small outbreaks in Sydney and on that study he came to the conclusion that Simond's theory that the flea on the rat, leaving the rat dead from plague and then biting man, transfers plague from the rat to man, explained the phenomena connected with plague. That theory, of which Dr. Ashburton Thompson is the champion, has recently received very valuable support in its favor from the very important experiments made by the Indian plague commission and which are the outcome of certain researches by Capt. W. G. Liston, I. M. S., to whom much credit is due for his excellent work in this direction. These experiments established first the accuracy of Simond's and Gauthier's and Raybaud's experiments as to the power of infected fleas from plague rats causing plague in healthy rats. * * * On the other hand, taking the most liberal interpretation of the flea theory based on the experiments mentioned, it is doubtful whether the flea theory will account for more than a certain percentage of the fatal bubonic cases which may vary in different circumstances in different localities. * * *

The food theory.—More post-mortem examinations are made on plague cases in Hongkong than in any other part of the world, and it is on the observations there both on man and animals that the theory has been formulated that the ingestion of food contaminated with the plague virus is the cause of septicæmic cases of plague. * * *

Measures to protect healthy districts.—A careful inspection of crates filled with goods from infected localities should be arranged for in order that any dead or sick rats may be immediately discovered and disposed of in a safe manner and the contaminated portion of the goods disinfected; for the same reason an inspection of fodder and loads of grain from infected localities is necessary. The warehouses attached to railways and docks require to be especially watched; also granaries, stables, slaughterhouses, and markets, where

rats from infected localities are likely to be imported and spread infection among indigenous rats or where contaminated goods infect healthy rats.

Measures in infected localities.—With regard to infected areas the only measures on a large scale available are inoculation, evacuation, and disinfection of infected houses and destruction of rats. * * * Evacuation of an infected locality and inoculation promptly carried out will stop any epidemic. In Cape Town plague was becoming serious among the Kaffirs. It was decided to remove them from their dwellings, where they were crowded together under most insanitary conditions, as bad as, if not worse than, any in India. In the course of a week from 7,000 to 8,000 were removed to a small village prepared for them and all were inoculated. The epidemic ceased among them, and although after two or three days' rest, in order that they should recover from the malaise caused by the inoculation, they came in regularly to Cape Town and often worked in infected portions of the town, they remained free from the disease.

In an infected area the measures to be adopted are controlled to some extent by circumstances. In some localities all the measures mentioned can be brought to bear, and of course these are the best conditions for success; but if plague is in a village where there are no means of disinfecting the huts and destroying the rats during the process of disinfection, then evacuation and inoculation are the only measures that can be practiced, and if inoculation is carried out the evacuation need only be as long as is necessary to allow of time for the inoculations.

Doctor Simpson recommends the exposure of grain to the sun, boiling the infected clothing, and general destruction of rats; and he insists particularly on fumigation by sulphur for the destruction not only of plague germs, but of all rats, fleas, bugs, and other insects in houses. On this subject he says:

Everything is disinfected in situ; the only articles that require to be removed are such foodstuffs as flour, fresh fruits, fish, and meat. Rice and grain need not be removed and would be disinfected along with the other contents of the house. * * * In the case of a plague patient being in the house and objections being raised to removal to hospital the patient can be made comfortable in a tent during the fumigation and be removed back to the house after twenty-four hours, for with the rats and insects destroyed there would be little danger of the spread of the disease. After the patient had recovered or died the house could be again disinfected.

In conclusion Doctor Simpson insists on the necessity of the formation of a special and trained plague service for the prevention and mitigation of plague in India.

UNITED STATES.

Plague in California—Service to assume charge of measures.

EXECUTIVE OFFICE,
Oyster Bay, N. Y., September 5, 1907.

Surgeon-General WYMAN,
Public Health and Marine-Hospital Service,
Washington, D. C.:

Following telegram received from mayor of San Francisco: "In view of existing sanitary conditions, it is desired that the Fed-